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ANALYSIS

The Great Black Box Debate

By Steven B. Miller
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*Truck drivers have gone from something like American cowboys to America's most closely watched workers —
at least in some cases and potentially across the board. Where does it stop?*

Of course, the term "black box" comes from the aircraft industry.

Federal authorities have long required flight data recorders on commercial airliners to provide insight into the causes of
crashes. Early data recorders were called black boxes because they were originally housed in, well, black boxes. The name
stuck even when the color didn't, in part because of the gloomy possibility they have always represented.

Trucking's black box
In trucking, the term black box is loosely applied to everything from the electronic control modules in diesel engines to the
on-board computers made by suppliers like Tripmaster, Cadec, Qualcomm, Xata, PeopleNet and MobilAria, among others.
In the current debate about hours of service, the term black box more properly applies to those brand- name on-board
computers. All of the companies noted above offer software that can create driver logs more-or-less automatically — that is
with little input from the driver. Even the smartest systems don't know if you are off-duty or on-duty, not driving. You have to
tell the system. But beyond that, it's pretty much a matter of you drive, you stop, it records.
When inspectors ask for your log, you call it up on your computer console and show them the screen. Some systems send
log information wirelessly back to the company, which can then fax an up-to-the-minute log page to authorities, at a weigh
station for example.
Automated logs are gaining popularity in private fleets, where corporate owners are anxious to avoid trouble — or even the
appearance of trouble — with the FMCSA. They're very rare in commercial trucking, with the notable exception of Werner
Enterprises, which has its very own paperless log system.
The activist groups CRASH and PATT have called for mandated automatic logs, which they say will prevent logbook cheating
and make sure drivers get adequate rest. They were not the first to make such a push.
Years before CRASH and PATT existed, Advocates for Highway and Auto Safety petitioned for on-board recorders in
trucks. For years, black boxes were on the National Transportation Safety Board's most wanted list.
But it isn't nearly as simple as it sounds. Once the government starts thinking of trucks like airliners, things get dicey.

How did we get here?
Engineers and fleet owners have always wanted trucks that create their own operating records, for a variety of reasons.
Engineers wanted to know how trucks performed to provide effective maintenance and to help build better trucks. Fleet
operators wanted to know how their trucks were being driven and what their drivers were doing.
Engineers got some information from odometers and devices that measured such things as engine hours. Fleet owners
began gathering operational information using devices like the tachograph.
Typically, a tachograph rotates a paper disk under a stylus that vibrates if the truck is running or moving and remains still
when it isn't. That creates either a jagged line or a straight line as the disk rotates. Because tachographs are timed to a clock,
the differences in lines can be matched to specific times of day — a crude record of when the truck was moving and when it
wasn't.
Some carriers, most notably UPS, used tachographs to help build extremely efficient operations.

Dawn of the digital age
Everything changed in the 1980s with the engine computer, called an ECU for electronic control unit or ECM for electronic

control module. Originally, these microprocessors determined the injection cycle on each cylinder. That required the computer to juggle such parameters as fuel flow, engine crankshaft position, rpm, engine coolant, intake air temperatures and more. Sensors gathered necessary information for the engine microprocessor.

During the 1990s, those microprocessors grew in memory and computing power, just as personal and business computers did. In trucks, more sensors were added, more data was gathered and more possibilities emerged.

Today, built-in microprocessors record data from hundreds of sources around the truck. Macks, for example, include two microprocessors, one in the engine and one in the cab. They record almost anything you think of, from speed, rpms and various temperatures to gears, pedal positions, brake applications, acceleration, deceleration — virtually everything but the driver's state of mind. And someone, somewhere is working on that, you can be sure.

In most cases, at least 10 seconds of information relevant to a crash — virtually all data — is retained in microprocessor memory. So, in most cases, the last 10 seconds of a truck's operating data before a violent incident can be extracted from a truck's microprocessors — presuming they survive the event.

Beyond that, built-in microprocessors can retain select pieces of data for very long periods of time and disgorge that information in the form of various reports. In most cases, that's all up to the truck's owner. The parameters can be set by truck dealers or by owners themselves using kits provided by OEM or engine manufacturers.

The relevant point is that while the black box may not be with us as a mandate, much of the information it tracks is already being gathered under your hood and behind your dashboard.

Those other computers

So if that much information is already being recorded in the guts of your truck, what are those other brand-name computers all about?

For the most part, they came into being for business purposes. Early on-board computers took the place of paper manifests. Drivers recorded deliveries and pickups by pushing buttons or pressing keys. The early on-board computers did what tachographs did and went a step further, enabling drivers to enter information.

In 1993, the Society of Automotive Engineers established what is known as the J1708 standard for moving data in and out of built-in microprocessors.

That meant those on-board computers were able to access a veritable sea of information.

Brand-name computers could monitor and store lots more of the information generated by built-in microprocessors than could those microprocessors themselves.

Now, on-board computers can record far more than merely when a truck arrived — they can document how it was driven along the way, whether it exceeded speed limits and much more.

Add Global Positioning System technology to that mix, and on-board computers can record where a driver has been as well as how efficiently he got there.

Add mobile communications, and the boss can be made aware of pretty much anything he might like to know, pretty much any time he wants to know it.

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Trucks and airplanes

The focus of airplane boxes is after-the-fact accident investigation. They are not meant to monitor the crew for disciplinary purposes. If they do establish human error, it's highly likely that the human involved has already paid the ultimate penalty; his letter of reprimand would have to be addressed to the Pearly Gates.

Automated logs for truckers, however, can be very much a disciplinary tool. The computers will report what they report, but the driver will be held responsible for whatever they show.

All the data already available in trucks is impressive. But so is the information that cannot be recorded. There are no sensors to record the realities that drivers cope with. Short of security cameras aimed at the driver seat (someone's probably working on that, too) they can't record everything a driver does, or why he does it. They can't record complex human situations or the unrelenting demands of the road.

Computers can't know, for example, that a driver is unable to find a truck stop parking slot — only that the truck slowed for a while, then went back to driving speed. They can't know that a state trooper chased the driver off an entrance ramp and forced him back on the road. They only know the truck stopped, then rolled again.

Automated logs mandated by law could be unfair to drivers. That much should be clear. But it could get worse. Will regulators stop at mandating automatic logs, or will they get creative?

Hey, the truck has mobile communications. Why not send out a message when the automated log says a driver is in violation? Why not have it broadcast to a state police frequency? Think of all the accidents that would prevent.

Let regulators demand computers in your truck and they'll surely begin thinking about the endless possibilities of all that data. If we're going to monitor a driver's hours of service for enforcement, why not make sure he stays below the speed limit as well? It makes simple, undeniable sense — at least to some people.

Go all the way down this path and we'll have state troopers downloading truck data wirelessly from the side of the road, then shutting down trucks with something like a TV remote.

Should regulators be perceiving us as such bad guys?

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Case shows darker side of black boxes

By Mark H. Reddig
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If you're worried about how black boxes in trucks could affect your privacy, here's something to ponder: A man has been charged with violating California's stalking laws after he allegedly used a Global Positioning System device to track and stalk his ex-girlfriend.

The incident, described in a report from the Glendale, CA, Police Department, involved the suspect allegedly attaching a cell phone with a GPS chip in it to the bottom of his ex-girlfriend's vehicle. He was then able to track the car.

The device was placed on the vehicle in August, police said, and officers have found documents that outline the victim's movements from that time.

The ex-girlfriend, who was not identified by police, had already been receiving up to 100 phone calls a day from the suspect. However, when she started running into her ex-boyfriend in person, she became suspicious. She called police when she caught him under her car changing the cell phone battery.

Glendale Police arrested Ara Gabrielyan, 32, in connection with the case. He has been arraigned and charged with felony stalking, and at press time was being held in the Twin Towers Correctional Facility in Los Angeles on $500,000 bond. He was scheduled to appear in Burbank Municipal Court in October.

Some proposals for placing black boxes in trucks have included the use of GPS devices for tracking loads, especially hazardous materials — an idea that has generated considerable opposition in the industry.

Sgt. Tom Lorenz — a spokesperson for the Glendale Police Department, which made the arrest in the case — said he was aware of the concerns some truckers have about the increased availability, and possible uses, of GPS devices.

"If they were to go pick up a load somewhere, and someone wanted to drop one of these tracking devices in one of the containers, or in one of the boxes or crates or whatever they're picking up, that person who has you delivering that item is tracking you across the United States," Lorenz said.

Lorenz said the device involved in the case links with an Internet mapping site, Mapquest.com.

"It puts your location on a map there so it's very easy to read," he said.

Black boxes in the air

The Federal Aviation Administration requires the recording of at least 88 parameters on aircraft manufactured after Aug. 19, 2002, including:
• Time;
• Acceleration;
• Airspeed;
• Altitude;
• Flap settings;
• Outside temperature;
• Cabin temperature;
• Cabin pressure;
• Fuel flow;
• engine performance and more.

Regulations also require a cockpit voice recorder that stores sound from four points:
• The pilot's headset;
• The co-pilot's headset;
• The headset of a third crew member (if there is a third crew member); and
• A microphone near the center of the cockpit, where it can pick up audio alerts and other sounds.

Most cockpit voice recorders retain at least 30 minutes of sound and airplane data recorders can store up to 25 hours of flight data.

Back to November 2004 Index